# Chapter 8

# Future Regulatory Changes

Evermore stringent drinking water regulations challenge public water systems to continually improve water quality. Systems not only have to focus on compliance with today's regulatory requirements, but must plan to meet tomorrow's standards as well. This section provides an overview of upcoming regulations as of March 2002 and how they apply to small water systems in Indiana.

## 8.1 Arsenic Rule

*Purpose*

Arsenic is a naturally occurring element found primarily in rocks, soil, water and plants. Natural events such as volcanic activity, erosion of rocks and forest fires can release arsenic into water. Industries such as wood preservation, mining, or smelting use arsenic and have been associated with releases into our drinking water supplies.

Naturally occurring arsenic is found in drinking water sources across the nation, with higher levels more often found in ground waters (i.e., wells) than in surface waters (i.e., lakes and rivers). Highest source water arsenic concentrations occur mostly in the southwestern United States, with some pockets in the Midwest and New England as illustrated in Figure 8.1.

Arsenic exposure has been linked to adverse health effects of cancerous and non-cancerous nature. To protect public health, the United States Environmental Protection Agency (USEPA) originally established a maximum contaminant level (MCL) of 50 parts per billion (or microgram per liter, μg/L) for arsenic in 1975. Recent studies have shown that adverse health effects occur at arsenic exposure levels lower than originally thought; the USEPA revised the Arsenic Rule by lowering the MCL to 10 μg/L in January 2001 (final rule).

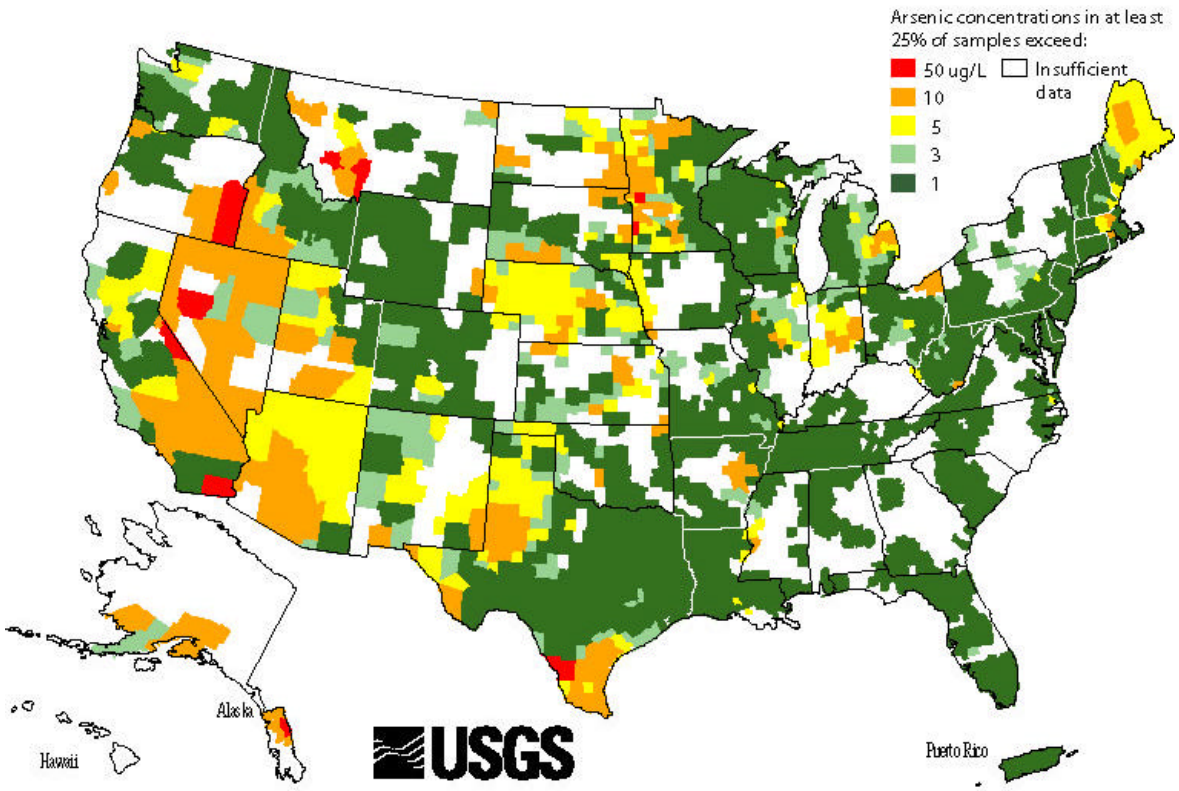


Figure 8.1
Arsenic Concentrations Found in at Least 25 Percent
of Ground Water Samples in Each County
*(source: United States Geological Survey, November 2001)*

*Applicability*

The revised Arsenic Rule applies to all community water systems (CWSs) and nontransient, noncommunity water systems (NTNCWSs).

*Schedule*

All systems with finished water arsenic concentrations in excess of the MCL of 10 µg/L will need to implement treatment methods for reducing arsenic to comply with rule requirements by January 2006.

*Requirements*

The Arsenic Rule requires systems to follow specific monitoring guidelines as outlined in Table 8.1. Systems must monitor for total arsenic in the finished water at each entry point to the distribution system.
Depending on the results of the initial monitoring period, systems will continue monitoring at a reduced or increased monitoring frequency. If initial arsenic levels are less than the MCL, then the system is eligible to monitor at a reduced frequency. If initial arsenic levels are higher than the MCL, quarterly sample collection is required at the sampling location of concern until the system is reliably and consistently below the MCL.

Table 8.1
Arsenic Rule
Monitoring Requirements for Finished Water

| Monitoring Event | Ground Water System Monitoring Frequency | Surface Water System Monitoring Frequency |
|---|---|---|
| Initial Monitoring | One sample between 2005 and 2007 | One sample after January 23, 2006 |
| Reduced Monitoring | One sample every three years | One sample every year |
| Increased Monitoring | One sample every quarter | One sample every quarter |

Under the revised Arsenic Rule, the Indiana Department of Environmental Management (IDEM) has the ability to issue nine-year monitoring waivers. To be eligible for a waiver, systems must have finished water arsenic levels that consistently measure below 10 µg/L. To demonstrate this, ground water systems must have collected a minimum of three samples at the scheduled frequency and surface water systems must have monitored annually for at least three years.

The Arsenic Rule also requires systems to follow specific reporting guidelines as outlined in Table 8.2. All systems with finished water arsenic levels greater than 5 µg/L must provide arsenic information to the public in their annual Consumer Confidence Reports (CCRs). The type of information required for the report is dependent on the level of arsenic detected in the finished water.

Federal funds are available to help small systems comply with regulatory requirements, such as the 10 µg/L arsenic MCL. The USEPA plans to provide up to $20 million in 2002 and 2003 for research and development of more cost-effective arsenic removal technologies. The USEPA also plans to provide technical assistance and training on the Arsenic Rule to operators of small systems.

Other federal funds may be available to States for water system infrastructure improvements for regulatory compliance through the State Revolving Loan Fund (SRLF), the Public Water Systems Supervision Grants Program, the Housing and Urban Development's Community Development Block Grant Program, or the Rural Utilities Service of the United States Department of Agriculture (USDA).

Table 8.2
Arsenic Rule Consumer Confidence Report (CCR) Requirements

| Report Due | Report Requirements |
|---|---|
| July 1, 2001 | For the report covering calendar year 2000, systems that detect finished water arsenic at levels between 25 μg/L and 50 μg/L must include an educational statement in the CCRs. |
| July 1, 2002 and beyond | For reports covering calendar years 2001 and beyond, systems that detect finished water arsenic between 5 μg/L and 10 μg/L must include an educational statement in the CCRs. |
| July 1, 2002 – July 1, 2006 | For reports covering calendar years 2001 to 2005, systems that detect finished water arsenic between 10 μg/L and 50 μg/L must include a health effects statement in their CCRs. |
| July 1, 2007 and beyond | For reports covering calendar years 2006 and beyond, systems that are in violation of the arsenic MCL (10 μg/L) must include a health effects statement in their CCRs |

*Source: USEPA Office of Water, "Arsenic and Clarifications to Compliance and New Source Monitoring Rule: A Quick Reference Guide" EPA 816-F-01-004, January 2001.*

## 8.2 Disinfection

### 8.2.1 Ground Water Rule

*Purpose*

Only surface water systems and systems using ground water under the direct influence of surface water (GWUDI) are currently required to disinfect their water supplies. However, recent research indicates that some ground waters are a source of waterborne disease.

The USEPA developed the Ground Water Rule (GWR) to protect public health from waterborne microorganisms present in ground water sources (i.e., sources unaffected by surface water). The GWR specifies the appropriate use of disinfection in ground water and establishes a strategy to identify ground water systems at high risk for contamination.

*Applicability*

The GWR applies to all public water systems using ground water.

*Schedule*

The Ground Water Rule was proposed in May 2000 and at the time this manual was printed, the rule was expected to become final in 2003.

*Requirements*

The five main rule requirements are summarized in Table 8.3 and are followed by a more detailed discussion.

Table 8.3
Ground Water Rule
Summary of Requirements

| Requirement | Applies to | Frequency | Key Components |
|---|---|---|---|
| Sanitary Survey | All ground water systems | • Community Water Systems (CWSs): every 3 years<br>• Noncommunity Water Systems (NCWSs): every 5 years | • IDEM must perform each system's sanitary survey and address 8 elements*<br>• IDEM must have authority to enforce corrective action requirements<br>• IDEM must provide a list of significant deficiencies to the system within 30 days of identification |
| Hydrogeologic Sensitivity Assessment | All ground water systems that do not provide 4-log virus removal/inactivation | One-time assessment of sensitivity<br>• CWSs: within 6 years of final rule<br>• NCWSs: within 8 years of final rule | • IDEM must conduct a one-time assessment of all systems that do not provide 4-log virus removal/inactivation to identify those systems located in sensitive aquifers<br>• EPA considers karst, gravel or fractured bedrock aquifers to be "sensitive" to microbial contamination<br>• IDEM may waive source water monitoring for sensitive systems if there is a hydrogeologic barrier to fecal contamination |
| Source Water Monitoring | Ground water systems that are sensitive or have contamination in their distribution system and do not provide 4-log virus removal/inactivation | • Monthly for sensitive systems<br>• Once for triggered monitoring | • Routine monitoring: for hydrogeologically sensitive system monthly source water monitoring for fecal indicators is required. The sampling frequency may be reduced after twelve negative samples.<br>• Triggered monitoring: if a total coliform positive sample is found in the distribution system, the collection of one source water sample analyzed for a fecal |

Table 8.3
Ground Water Rule
Summary of Requirements

| Requirement | Applies to | Frequency | Key Components |
|---|---|---|---|
| | | | indicator is required |
| Corrective Actions | Ground water systems that have a significant deficiency or have detected a fecal indicator in their source water | Correct within 90 days or within an IDEM-approved schedule (which can be longer than 90 days) | • If significant deficiencies or a coliform-positive source water sample are identified, a system must correct the contamination problem within specified time period.<br>• Corrective actions may include elimination of the contamination source, correction of the significant deficiencies, provision of an alternative source water, or addition of treatment to achieve 4-log virus removal/inactivation.<br>• Systems must notify IDEM of completion of corrective action or IDEM must confirm corrective action within 30 days after the scheduled correction date.<br>• Systems providing treatment must monitor to ensure at least 4-log virus removal/inactivation is achieved. |
| Compliance Monitoring | All ground water systems that notify IDEM that they disinfect:<br>• to avoid source water monitoring; or<br>• as a corrective action. | Systems must monitor disinfection treatment at a frequency based on size<br>• Systems serving fewer than 3,300 people: once daily<br>• Systems serving 3,300 or more people: continuously (on-line monitoring) | • If monitoring shows the disinfectant concentration to be below the required level, the system must either restore the disinfectant concentration within 4 hours or notify IDEM. |

*Sanitary Surveys.* The GWR requires the Indiana Department of Environmental Management (IDEM) to conduct periodic sanitary surveys of all ground water systems. A sanitary survey is an on-site review of the water source, facilities, equipment, operation, maintenance, and monitoring compliance of a public water system. The purpose is to evaluate the adequacy of the system, its sources and operations, and the distribution of safe drinking water.

Sanitary surveys must address all eight elements set out in the "EPA/State Joint Guidance on Sanitary Surveys" (1995). IDEM must provide written notification to the system, which identifies and describes any significant deficiencies found in the sanitary survey no later than 30 days after completing the on-site survey.

Following are the eight elements to be addressed:

1. Source. The reliability, quality, and quantity of the source will be evaluated during the sanitary survey. The survey will assess the potential for contamination from activities within the watershed as well as from the physical components and condition of the source facility.
2. Treatment. The evaluation of the treatment process will consider the handling, storage, use, and application of treatment chemicals. The operation, maintenance, record-keeping and management practices of the treatment system will also be evaluated.
3. Distribution System. A thorough inspection of the distribution network is important. Review of leakage, monitoring of the disinfectant residual, installation and repair procedures of mains and services, and an assessment of the conditions of all piping and associated fixtures are necessary to maintain distribution system integrity.
4. Finished Water Storage. The adequacy of construction and maintenance of the facilities will be assessed.
5. Pumps, Pump Facilities and Controls. The survey will verify that the pump and its facilities are of appropriate design and are properly operated and maintained.
6. Monitoring, Reporting and Data Verification. Monitoring and reporting are needed to determine compliance with drinking water provisions and to verify the effectiveness of source water protection, preventative maintenance, treatment, and other compliance-related issues regarding water quality or quantity.
7. System Management and Operation. A review of the management process will verify that continued and reliable operation is being met through adequate staffing, operating supplies, and equipment repair and replacement.
8. Operator Compliance with State Requirements. A review of operator training and certification will ensure compliance with IDEM requirements.

As part of the sanitary survey, IDEM may identify a significant deficiency. This is a defect in design, operation, or maintenance, or a failure or malfunction of the sources, treatment, storage, or distribution system that IDEM determines to be causing, or has the potential for causing, the introduction of contamination into water delivered to consumers.

Deficiencies may include, but are not limited to:

- Unsafe source (e.g., location close to septic systems, sewer lines, feed lots);
- Wells of improper construction;
- Presence of fecal indicators in raw water samples;
- Lack of proper cross connection control for treatment chemicals;
- Lack of redundant mechanical components where chlorination is required for disinfection;
- Improper venting of storage tank;
- Lack of proper screening of finished water storage overflow pipe and drain;
- Inadequate roofing (e.g., holes in the storage tank, improper hatch construction);
- Inadequate internal cleaning and maintenance of storage tank;
- Unprotected cross connection (e.g., hose bibs without vacuum breakers);
- Unacceptable system leakage that could result in entrance of contaminants; or
- Inadequate monitoring of disinfectant residual and Total Coliform Rule MCL or monitoring violations.

The frequency of the surveys depends on the system type – surveys must be conducted every three years for community water systems and every five years for noncommunity water systems.

*Hydrogeologic Sensitivity Assessment.* The GWR also requires IDEM to conduct a one-time hydrogeologic sensitivity assessment for undisinfected systems, or for those systems that do not provide 4-log (99.99%) virus removal and/or inactivation. A hydrogeologic sensitivity assessment is designed to identify wells that may be sensitive to fecal contamination. Sensitive hydrogeologic settings are aquifers that allow ground water to travel at high velocities. Information used to conduct the assessment may include data from State geological surveys, United States Geological Service (USGS) maps, the USEPA Source Water Assessment and Protection Program, or other sources.

The USEPA identifies sensitive systems as those that use water obtained from fractured bedrock, karst, or gravel hydrogeologic settings unless protected by a hydrogeologic barrier. IDEM may use alternative methods to identify sensitive systems such as horizontal ground water travel time, setback distance between a well and potential contamination source, and well and water table depth.

A hydrogeologic barrier consists of physical, chemical and biological factors that, singularly or in combination, prevent the movement of viable pathogens from a contaminant source to a public water supply well.

Examples of characteristics to be considered in determining the presence of a hydrogeologic barrier include: (1) subsurface vertical and horizontal ground water travel times or distances sufficiently large so that pathogens become inactivated as they travel from a source to a public water supply well, or (2) unsaturated geological material sufficiently thick so that infiltrating precipitation mixed with fecal contaminants is effectively filtered during downward flow to the water table. A confining layer is an example of a hydrogeologic barrier.

*Source Water Monitoring.* The GWR requires systems that do not disinfect, draw from hydrogeologically sensitive aquifers or have detected fecal indicators within the system's distribution system, to conduct source water microbial monitoring. The USEPA proposes that *E. coli*, coliphage, or enterococci be used as fecal indicators.

Hydrogeologically sensitive systems are required to sample monthly. IDEM may reduce routine source water monitoring frequency to quarterly if a hydrogeologically sensitive system detects no fecal indicator-positive samples in the most recent 12 monthly samples. Additionally, after the 12 monthly samples, IDEM may also waive source water monitoring altogether if IDEM determines and documents in writing that fecal contamination is highly unlikely based on sampling history, land use pattern, disposal practices and proximity to septic tanks and other fecal contamination sources. If circumstances change, IDEM may reinstate routine monthly sampling.

In addition to routine monitoring, ground water systems that do not provide 4-log virus removal/inactivation may be required to collect at least one source water sample within 24 hours of receiving notification of a total coliform-positive under the Total Coliform Rule (TCR). This requirement is in addition to all monitoring and testing requirements under the TCR.

*Corrective Action.* If any significant deficiencies or positive microbial samples indicating fecal contamination are identified, then the systems must provide corrective action within 90 days or within an IDEM-approved schedule. Corrective actions may include one or more of the following: (1) elimination of the source of contamination, (2) correction of the significant deficiency, (3) provision of an alternate source water, or (4) provision of treatment to achieve 4-log virus removal/inactivation.

*Compliance Monitoring.* All systems that provide 4-log removal/inactivation of viruses will be required to conduct compliance monitoring, at a frequency based on the population served.
Systems serving fewer than 3,300 people must monitor disinfectant residual at each point of entry to the distribution system daily, while systems serving 3,300 or more people are required to conduct continuous disinfectant residual monitoring.

### 8.2.2 Long-Term 1 Enhanced Surface Water Treatment Rule

*Purpose*

The purpose of the Long Term 1 Enhanced Surface Water Treatment Rule (LT1-ESWTR) is to improve small systems' control of microbial pathogens in drinking water, particularly for the protozoan *Cryptosporidium*. In addition, the rule includes provisions to assure continued levels of microbial protection while utilities take the necessary steps to comply with new disinfection by-product (DBP) standards.

*Applicability*

The LT1-ESWTR applies to public water systems that use surface water or ground water under the direct influence of surface water (GWUDI) and serve fewer than 10,000 people.

*Schedule*

The LT1-ESWTR became final in July 2001. Systems serving 500 to 9,999 people must have complied with disinfection profiling requirements by January 2003 and those serving 25 to 499 people must have compied by July 2003. Transient, noncommunity systems are exempt from disinfection profiling.

*Requirements*

The LT1-ESWTR established a maximum contamination level goal (MCLG) of zero for *Cryptosporidium*. All systems serving fewer than 10,000 people that are required to filter under the SWTR must achieve at least a 2-log removal of *Cryptosporidium*.

If systems using conventional or direct filtration comply with reduced turbidity standards for combined filter effluent and with current requirements under the SWTR (i.e., meet design and operating conditions as specified by IDEM), then the systems meet the *Cryptosporidium* removal requirements. Systems using slow sand filtration or diatomaceous earth meet the 2-log removal requirement if they meet existing SWTR turbidity standards. Unfiltered systems must comply with updated watershed control requirements that add *Cryptosporidium* as a pathogen of concern.

Surface water or GWUDI systems that use conventional treatment or direct filtration must meet combined filter effluent turbidity performance requirements. The turbidity level of a system's combined filter effluent at each plant must be less than or equal to 0.3 NTU in at least 95 percent of the measurements taken each month and must at no time exceed 1.0 NTU. Compliance is determined based on measurements of the combined filter effluent at four-hour intervals. If at any time the turbidity exceeds 1.0 NTU in representative samples, the system must inform IDEM no later than the end of the next business day. Affected systems must also meet rule requirements for individual filter performance as established by the LT1-ESWTR.

1. Conduct continuous monitoring of effluent turbidity for each individual filter.
2. Provide an exceptions report to IDEM on a monthly basis, including:
   - Any individual filter with a turbidity level greater than 1.0 NTU based on two consecutive measurements fifteen minutes apart.
   - Any individual filter with turbidity greater than 0.5 NTU at the end of the first four hours of continuous filter operation based on the two consecutive measurements fifteen minutes apart.
   - If no obvious reason for the abnormal filter performance can be identified, the exceptions report should include a filter profile (graphical representation of an individual filter performance) that was developed within seven days of the exceedance.
3. If an individual filter turbidity level is greater than 1.0 NTU, based on two consecutive measurements fifteen minutes apart at any time in each of three consecutive months, the system must provide an exceptions report (within 30 days of the exceedance) and conduct a self-assessment of the filter according to the USEPA's guidance for Comprehensive Performance Evaluation.

4. If an individual filter has turbidity greater than 2.0 NTU, based on two consecutive measurements fifteen minutes apart at any time in each of two consecutive months, the system must provide an exceptions report (within 30 days of the exceedance) and arrange for a Comprehensive Performance Evaluation (CPE) by the State or a third party approved by IDEM.

All new reservoirs, holding tanks or other storage facilities for finished water for which construction begins 60 days after the effective date of this rule require covers. The rule does not apply these requirements to existing uncovered finished water reservoirs.

USEPA published the "Disinfection Profiling and Benchmarking Guidance Manual" for States and systems, which includes guidance for disinfection profile development, identification and evaluation of disinfection practice changes, and considerations for setting alternative benchmarks. Figure 8.2 outlines the decision process to determine whether profiling and/or benchmarking of *Giardia* and/or viruses will be necessary.

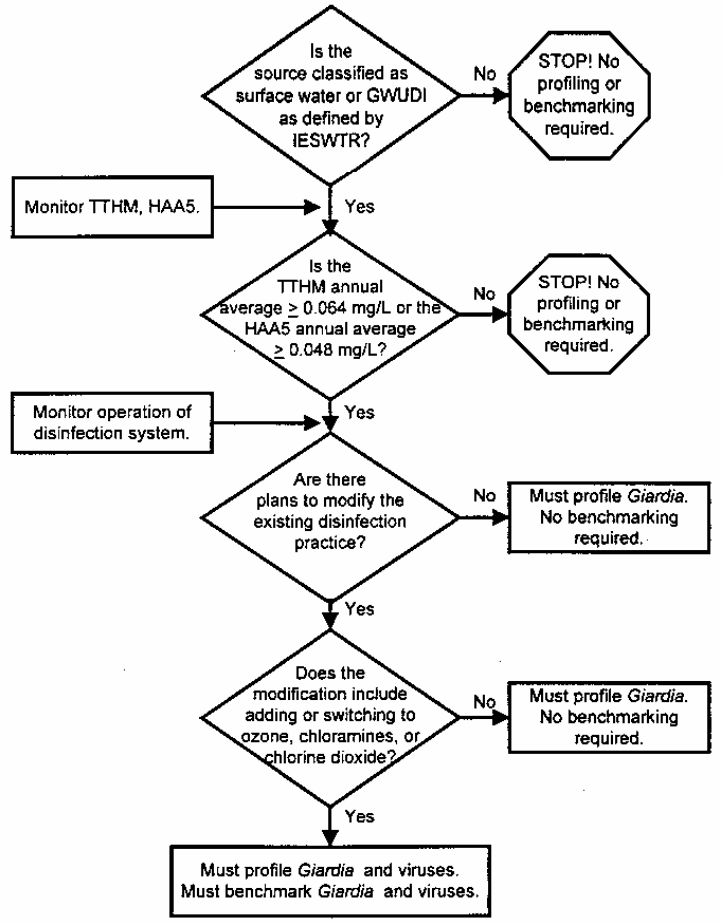


Figure 8.2
Disinfection Profiling and Benchmarking Decision Tree

All surface water and GWUDI treatment systems serving fewer than 10,000 people, except those classified as transient/noncommunity, are required to develop a disinfection profile, calculating their *Giardia lamblia* inactivation ratio once per week. Systems using chloramines, ozone, or chlorine dioxide must also calculate the logs of inactivation for viruses. Systems may forgo development of a disinfection profile if they demonstrate that their levels of total trihalomethanes (TTHM) and sum of five haloacetic acids (HAA5) are below 0.064 mg/L and 0.048 mg/L, respectively.

All systems that must develop a disinfection profile or that are considering making a significant change to disinfection practices are required to develop a disinfection benchmark. The benchmark, or the month with the lowest average of *Giardia* and/or virus log inactivation, will be calculated based on the data used to generate the disinfection profile and the results must be given to the State for approval.

### 8.2.3 Filter Backwash Recycle Rule

The Filter Backwash Recycle Rule (FBRR) applies to all public water systems that (1) use surface water or ground water under the direct influence of surface water (GWUDI); (2) utilize direct or conventional filtration processes; and (3) recycle spent filter backwash water, sludge thickener supernatant, or liquids from dewatering processes. The purpose of the FBRR is to require systems to review their recycle practices and, where appropriate, work with the State to make any necessary changes to recycle practices that may compromise microbial control.

The rule was promulgated in April 2001. Systems must notify IDEM of their recycle practices by October 2003, modify recycle return location as required by April 2004, and complete capital improvements necessary to comply with all rule requirements by April 2006.

The FBRR requires that recycled filter backwash water, sludge thickener supernatant, and liquids from dewatering processes must be returned to a location in the plant such that all processes of a system's conventional or direct filtration including coagulation, flocculation, sedimentation (conventional filtration only) and filtration, are employed after the recycle stream is introduced.

Systems must notify IDEM in writing of their recycle practices. The system must provide a plant schematic showing the origin of all recycle flows, the piping used to transport them, and the location where they are recycled back into the plant.

In addition, the system must provide information on typical recycle flow (gpm), highest observed plant flow experienced in the previous year (gpm), design flow for the treatment plant (gpm), and the IDEM-approved operating capacity for the plant where IDEM has made such determinations.

IDEM will then evaluate a system's recycle practices and determine if relocation of recycle location or other modifications are necessary. For IDEM to make this determination, systems must collect and maintain the following information for review:

- List of all recycle flows and the frequency with which they are returned;
- Average and maximum backwash flow rate through the filters and the average and maximum duration of the filter backwash process in minutes;
- Typical filter run length and a written summary of how filter run length is determined (head loss, turbidity, time, etc.);
- The type of treatment provided for the recycle flow;
- Data on the physical dimensions of the equalization and/or treatment units, typical and maximum hydraulic loading rates, type of treatment chemicals used and average dose and frequency of use, and frequency at which solids are removed where such units are used; and
- Copy of the recycle notification and information submitted to IDEM.

### 8.2.4 Stage 1 Disinfectants/Disinfection By-Products Rule

*Purpose*

The Stage 1 Disinfectants/Disinfection By-Products Rule (Stage 1 DBPR) updates and supersedes the 1979 regulations for total trihalomethanes. Its purpose is to reduce public exposure to three chemical disinfectants (chlorine, chloramine and chlorine dioxide) and many disinfection byproducts (total trihalomethanes, haloacetic acids, chlorite and bromate).

*Applicability*

The Stage 1 DBPR applies to all community and nontransient, noncommunity water systems that treat their water with a chemical disinfectant for either primary or residual treatment.

*Schedule*

The rule was promulgated in December 1998 (63 FR 69389, Vol. 63, No. 241). Systems serving fewer than 10,000 people must meet requirements by January 2004.

*Limits*

The Stage 1 DBPR establishes limits on disinfectant residuals (maximum residual disinfectant level, MRDL) and disinfection by-products (maximum contaminant level, MCL) as summarized in Table 8.4. Systems must meet these limits and implement the treatment techniques described as enhanced coagulation or enhanced softening.

**Table 8.4**
**Stage 1 DBPR**
**Limits**

| Disinfectant Residual | MRDL (mg/L) | Compliance Based On |
|---|---|---|
| Chlorine | 4.0 (as $Cl_2$) | Annual Average |
| Chloramine | 4.0 (as $Cl_2$) | Annual Average |
| Chlorine Dioxide | 0.8 (as $ClO_2$) | Daily Samples |
| **Disinfection Byproducts** | **MCL (mg/L)** | **Compliance Based On** |
| Total trihalomethanes (TTHM)[1] | 0.080 | Annual Average |
| - Chloroform | | |
| - Bromodichloromethane | | |
| - Dibromochloromethane | | |
| - Bromoform | | |
| Haloacetic acids (five) (HAA5)[2] | 0.060 | Annual Average |
| - Dichloroacetic acid | | |
| - Trichloroacetic acid | | |
| Chlorite | 1.0 | Monthly Average |
| Bromate | 0.010 | Annual Average |

[1] Total trihalomethanes is the sum of the concentrations of chloroform, bromodichloromethane, dibromochloromethane, and bromoform.

[2] Haloacetic acids (five) is the sum of the concentrations of mono-, di-, and trichloroacetic acids and mono- and dibromoacetic acids.

*Treatment Techniques*

Natural organic matter (NOM) reacts with disinfectants to produce disinfection by-products (DBPs). Removing DBP precursors such as NOM is a treatment technique to reduce DBP formation. Step 1 requires water systems to remove specified percentages of natural organic materials, measured as total organic carbon (TOC). To encourage reduction of the organic matter that leads to DBP formation, the Stage 1 DBPR establishes targets for precursor removal to be achieved based on raw water TOC and alkalinity as shown in Table 8.5.

If a system achieves these TOC percent removals, then the treatment technique criterion for Stage 1 is satisfied. If a system is unable to meet the TOC removal requirements, an alternative percent TOC removal requirement may be selected by Step 2 procedures.

Table 8.5
Stage 1 DBPR Treatment Technique – Step 1
Required Removal of Total Organic Carbon by Enhanced Coagulation and Enhanced Softening for Systems Using Conventional Treatment[1]

| Source Water TOC (mg/L) | Source Water Alkalinity (mg/L as $CaCO_3$) | | |
|---|---|---|---|
| | 0-60 | >60-120 | >120[2] |
| >2.0-4.0 | 35% | 25% | 15% |
| >4.0-8.0 | 45% | 35% | 25% |
| >8.0 | 50% | 40% | 30% |

[1] Systems meeting at least one of the alternative compliance criteria in the rule are not required to meet the removals in this table.
[2] Systems practicing softening must meet the TOC removal requirements in the last column to the right.

For systems practicing enhanced coagulation, Step 2 of the treatment technique requirement is used to set an alternative enhanced coagulation level (i.e., to define an alternative percent removal of TOC from raw water) for those systems unable to meet the TOC removal percentages specified in the matrix. The alternative TOC removal percentage is determined by performing the following procedure.

1. Perform bench or pilot tests in which alum (as $A1_2(SO_4)_3*14H_2O$) or an equivalent dose of ferric coagulant is added in 10 mg/L increments until the pH is lowered to the target pH value. The target pH is the value the sample must be at or below before the incremental addition of coagulant can be discontinued. Table 8.6 details the target pH for varying source water alkalinities.

Table 8.6
Stage 1 DBPR Treatment Technique – Step 2
Target pH

| Alkalinity (mg/L as $CaCO_3$) | Maximum pH |
|---|---|
| 0 to < 60.0 | 5.5 |
| ≥ 60.0 to < 120.0 | 6.3 |
| ≥120.0 to < 240.0 | 7.0 |
| ≥ 240.0 | 7.5 |

2. Once the bench or pilot test is complete, plot TOC removal (mg/L) versus coagulant dose (mg/L).
3. Set the alternative TOC removal percentage at the point on the TOC versus coagulant dose plot where the slope changes from greater than 0.3/10 to less than 0.3/10 and remains less than 0.3/10. If the TOC removal versus coagulant dose plot does not reach this point of diminishing returns, the water is considered not amenable to enhanced coagulation and a waiver from the enhanced coagulation requirements may be obtained from the State.

*Exceptions for Treatment Techniques*

USEPA has not identified a Step 2 procedure for softening systems to set alternative TOC removal amounts. Enhanced softening systems unable to meet the Step 1 TOC removal requirements may either (1) remove at least 10 mg/L magnesium hardness (as $CaCO_3$), or (2) lower alkalinity to less than 60 mg/L (as $CaCO_3$). Satisfaction of these alternative performance criteria are measured monthly and calculated quarterly as a running annual average.

Implementation of enhanced treatment in difficult-to-treat waters may be costly and may introduce other water quality problems. Therefore, exception criteria have been proposed which allow systems to forego the treatment requirement. These criteria either recognize the low potential of certain waters to produce DBPs or account for types of water that contain TOC that is difficult to remove. Exceptions have been proposed for conventional coagulation treatment systems.

A system does not have to implement enhanced coagulation if any of the listed criteria are true. TOC and SUVA (specific ultraviolet light absorbance) levels are based on monthly monitoring and calculated quarterly as a running annual average of all measurements. TTHMs and HAA5 values are based on quarterly monitoring and are also calculated quarterly as a running annual average of all measurements.

1. Source water TOC is less than 2.0 mg/L.
2. Treated water TOC is less than 2.0 mg/L.
3. Source water TOC is less than 4.0 mg/L, raw water alkalinity is greater than 60 mg/L as $CaCO_3$, distribution system TTHM and HAA5 concentrations are less than or equal to 40 ìg/L and 30 ìg/L, respectively.
4. Distribution system TTHM and HAA5 concentrations are less than or equal to 40 ìg/L and 30 ìg/L, respectively, and the system uses only free chlorine for disinfection. TTHMs and HAA5 values are based on quarterly monitoring and are also calculated quarterly as a running annual average of all measurements.
5. Source water SUVA is less than 2.0 L/mg-m. SUVA is calculated by dividing UV absorbance ($m^{-1}$) at 254 nm by the concentration (mg/L) of dissolved organic carbon (DOC).
6. Treated water SUVA is less than 2.0 L/mg-m.

*Monitoring*

Systems must follow the monitoring requirements as outline in Table 8.7. If a system meets the eligibility requirements in Tables 8.8 and 8.9, then reduced monitoring requirements, as outlined in Table 8.10, apply.

Table 8.7
Routine Monitoring [1]

| Requirement | Location for sampling | Small surface systems[2] | Small ground water systems[3] |
|---|---|---|---|
| TOC and Alkalinity | - Source water (Paired samples)[4]<br>- Only required for plants with conventional filtration treatment | 1 paired sample/ month/ plant [3] | Not Applicable |
| TTHMs and HAA5 | (If more than 1 sample is collected) 25% in distribution system at maximum residence time, 75% at distribution system in representative locations | - 1/plant/quarter[5] at maximum residence time<br>- If pop. <500, then 1/plant/yr[8] during warmest month at maximum residence time | 1/plant/quarter[5,6] at maximum residence time during warmest month |
| Bromate[7] | Distribution system entry point | 1/month/plant using $O_3$ | 1/month/plant using $O_3$ |
| Chlorite[8] (daily)<br>Chlorite (monthly) | - Distribution system entry point.<br>- Distribution system: 1 near first customer, 1 in middle, 1 at maximum residence time<br>- | - Daily/plant using $ClO_2$<br>- 3 sample set/month | - Daily/plant using $ClO_2$<br>- 3 sample set/ month |
| Chlorine and Chloramines | Same points as coliform in Total Coliform Rule (TCR) | Same times as coliform in TCR | Same times as coliform in TCR |
| Chlorine dioxide[8] | Distribution system entry point | Daily/plant using $ClO_2$ | Daily/plant using $ClO_2$ |

1 Sample must be taken during representative operating conditions. Provisions for reduced monitoring shown elsewhere.
2 Small surface systems serve fewer than 10,000 persons.
3 Small systems using ground water not under the direct influence of surface water serve few than 10,000 persons.
4 Surface Water (or groundwater systems not under the direct influence of surface water) systems which use conventional filtration treatment must monitor 1) source water TOC prior to any treatment and 2) treated TOC before continuous disinfection at the same time; these two samples are called paired samples. Systems must take a source water alkalinity sample at the same time.
5 If the annual monitoring exceeds the MCL, the system must increase monitoring frequency to 1/plant/quarter. Compliance determinations will be based on the running annual average of quarterly monitoring results.
6 Multiple wells drawing water from a single aquifer may, with State approval, be considered one treatment plant for determining the minimum number of samples.
7 Only required for systems using ozone for oxidation or disinfection.
8 Only required for systems using chlorine dioxide for oxidation or disinfection. Additional chlorite monitoring required if daily sample exceeds MCL. Additional chlorine dioxide monitoring requirements apply if any chlorine dioxide sample exceeds the MRDL.

Table 8.8
Eligibility for Reduced Monitoring [1]
Surface Water Systems Serving 500 or More People

Surface water systems serving 500 or more people, may reduce monitoring of TTHMs and HAA5 if they meet all of the following conditions:

- At least one year of routine monitoring has been completed.
- The annual average for TTHMs is no more than 40 µg/L.
- The annual average for HAA5 is no more than 30 µg/L.
- Annual average source water Total Organic Carbon (TOC) level is no more than 4.0 mg/L prior to treatment.

1 Systems on reduced monitoring may remain on the reduced schedule as long as the TTHMs and HAA5 are 0.060 mg/L and 0.045 mg/L, respectively. (Based on the average of samples for systems monitoring quarterly and on the result of the sample for systems monitoring annually.)

Table 8.9
Eligibility for Reduced Monitoring [1]
Ground Water Systems Serving Fewer than 10,000 People

Systems using ground water not under the direct influence of surface water that serve fewer than 10,000 people may reduce monitoring for TTHMs and HAA5 if they meet either of the following conditions:

- The average of two consecutive samples for TTHMs is no more than 40 µg/L, the average of two consecutive annual samples for HAA5 is no more than 30 µg/L and at least two years of routine monitoring has been completed.
- The annual sample for TTHMs is no more than 20 µg/L, the annual sample for HAA5 is no more than 15 µg/L and at least one year of routine monitoring has been completed.

1 Systems on reduced monitoring may remain on the reduced schedule as long as the TTHMs and HAA5 are 0.060 mg/L and 0.045 mg/L, respectively. (Based on the average of samples for systems monitoring quarterly and on the result of the sample for systems monitoring annually.)

Table 8.10
Reduced Monitoring Requirements for Systems Disinfecting with Chlorine or Chloramines[1]

| Analyte | Sampling Location | Reduced Monitoring Frequency and Prerequisites[2] |
|---|---|---|
| TOC and Alkalinity | Paired samples[3] | Surface water systems or groundwater systems under the direct influence of surface water systems-reduced to 1 paired sample/plant/quarter if 1) Average TOC <2.0 mg/L for 2 years or 2) Average TOC <1.0 mg/L for 1 year. |
| TTHMs and HAAs | In distribution system at point with maximum residence time | - Monitoring cannot be reduced if source water TOC >4.0 mg/L.<br>- Surface water systems or groundwater systems under the direct influence of surface water serving <10,000 and ground water systems[6] serving 10,000 or more-reduced to 1/plant/year if (1) system has completed at least 1 yr. of routine monitoring AND (2) *both* TTHM and THAA running annual averages are no more than 40 ìg/L and 30 ìg/L, respectively. Samples must be taken during month of warmest water temperature. Surface water systems or groundwater systems under the direct influence of surface water serving <500 may not reduce monitoring to less than 1/plant/year.<br>- Groundwater systems[6] serving <10,000-reduced to 1/plant/3 years if (1) system has completed at least 2 years of routine monitoring and *both* TTHM and HAA5 running annual averages are no more than 40 ìg/L and 30 ìg/L, respectively; OR (2) system has completed at least 1 year of routine monitoring and *both* TTHM and THAA annual samples are no more than 20 ìg/L and 15 ìg/L, respectively. Samples must be taken during month of warmest water temperature. |
| Bromate[5] | Distribution system entrance point | 1/quarter/plant using $O_3$, if system demonstrates average raw water bromide <0.05 mg/L (based on annual average of monthly samples). |
| Chlorite[6] | Distribution system: 1 near first customer, 1 in system middle, 1 at maximum residence time. | Systems may reduce routine distribution system monitoring from monthly to quarterly if the chlorite concentration in all samples taken in the distribution system is below 1.0 mg/L for a period of one year; 3 samples per quarter |
| Chlorine and Chloramines | Not applicable | Monitoring may not be reduced. |
| Chlorine dioxide[6] | Not applicable | Monitoring may not be reduced. |

1 Samples must be taken during representative operating conditions. Pr ovisions for routine monitoring shown elsewhere.
2 Requirements for cancellation of reduced monitoring are found in the regulation.
3 Surface water systems or groundwater systems under the direct influence of surface water systems which use conventional filtration treatment must monitor 1) source water TOC prior to any treatment and 2) treated TOC before continuous disinfection (except that systems using ozone followed by biological filtration any sample after biological filtration) at the same time; these two samples are called paired samples.
4 Multiple wells drawing water from a single aquifer may, with State approval, be considered one treatment plant for determining the minimum number of samples.
5 Only required for systems using ozone for oxidation or disinfection.
6 Only required for systems using chlorine dioxide for oxidation or disinfection.

### 8.2.5 Long-Term 2 Enhanced Surface Water Treatment Rule

*Purpose*

The purposes of the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) are (1) to improve control of microbial pathogens, particularly *Cryptosporidium*, and (2) to address risk trade-offs with disinfection by-products.

*Applicability*

The LT2ESWTR will apply to all public water systems that use surface water or ground water under the direct influence (GWUDI) of surface water.

*Schedule*

The LT2-ESWTR is expected to be proposed in 2003 and finalized in 2004. Compliance dates may be simultaneous with those for the Stage 2 Disinfectants/Disinfection By-Products Rule (Stage 2 DBPR) – anticipated between 2008 and 2010. A two-year compliance deadline extension may be granted to systems requiring capital improvements.

*Requirements*

Key requirements established in the LT2-ESWTR include:

- Source water monitoring for *Cryptosporidium* (summarized in Table 8.11);
- Additional treatment to control *Cryptosporidium* based on source water concentrations;
- Inactivation of *Cryptosporidium* by all unfiltered systems;
- Disinfection profiling and benchmarking to ensure levels of microbial protection while steps are taken to comply with new disinfection by-product standards;
- Covering, treating, or implementing a risk management plan for uncovered finished water reservoirs; and
- "Toolbox" options that water systems may implement or may be required to implement to meet *Cryptosporidium* treatment requirements.

Table 8.11
Monitoring Requirements

| Public Water Systems | Monitoring Begins | Monitoring Duration | Analytes and Sample Frequency: *Cryptosporidium* | Analytes and Sample Frequency: *E. coli* | Analytes and Sample Frequency: Turbidity |
|---|---|---|---|---|---|
| Small systems (<10,000 people) | 2 ½ years after promulgation of LT2ESWTR | 1 year [a,b] | See below † | 1 every 2 weeks | N/A |
| | † Possible additional monitoring requirement for *Cryptosporidium* ***If*** small systems exceed *E. coli* trigger levels, ***then***… | | | | |
| Small systems (<10,000 people) | 4 years after promulgation of LT2ESWTR | 1 year | 2 samples/mo | N/A | N/A |

[a] Public water systems may be eligible to use historical data in lieu of these requirements if certain quality assurance and quality control criteria are met.
[b] Small systems may be required to monitor for *Cryptosporidium* for one year, beginning 6 months after completion of *E. coli* monitoring, if the *E. coli* annual mean concentrations exceed 10/100 mL for systems using lakes/reservoirs or exceed 50/100 mL for systems using flowing streams.
[c] Public water systems monitoring for *Cryptosporidium* may collect more than 1 sample per month if sampling is evenly spaced over the monitoring period.

Depending on source water quality, each water system will be classified into one of four "bins." Additional treatment requirements depend on bin classification (see Table 8.12).

Table 8.12
*Cryptosporidium* Treatment Requirements

| Bin Number | Average *Cryptosporidium* Concentration (#/L) | Additional treatment requirements for systems with conventional or softening treatment that are in compliance with the IESWTR or LT1ESWTR |
|---|---|---|
| **1** | <0.075 | No action (3-log total [1]) |
| **2** | /0.075 & <1.0 | 1-log treatment (4-log total [1]) |
| **3** | /1.0 & <3.0 | 2.0-log treatment [2] (5-log total [1]) |
| **4** | /3.0 | 2.5-log treatment [2] (5.5-log total [1]) |

[1] 3-log removal credit is assigned to systems in compliance with the Interim Enhanced Surface Water Treatment Rule (IESWTR) or Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR).
[2] At least 1-log treatment must be achieved using ozone, chlorine dioxide, UV, membranes, bag/cartridge filters, or in-bank filtration.

Other monitoring requirements include:

- USEPA is evaluating alternative surrogate indicators for predicting *Cryptosporidium* occurrence based on LT2ESWTR results from large and medium systems. In the absence of such a surrogate, small systems would begin one year of source water monitoring for *E. coli* two years after large and medium systems start their *Cryptosporidium* monitoring. Small systems would then have to monitor for *Cryptosporidium* if their *E. coli* levels exceed certain trigger levels.
- Source water *Cryptosporidium* monitoring must be done using EPA Method 1622/23 and no less than 10-liter samples.

- Systems with at least 2 years of historical *Cryptosporidium* data that are equivalent in sample number, frequency, and data quality (*e.g.*, volume analyzed, percent recovery) to data that would be collected under the LT2ESWTR with EPA Method 1622/23 may use those data to determine bin classification in lieu of further monitoring. Such data should be submitted to the State/Primacy Agency for consideration.
- Systems that provide 2.5 logs of treatment for *Cryptosporidium* (equivalent to Bin 4, including inactivation) in addition to conventional treatment are exempt from monitoring for purposes of selecting bin placement.
- Bin classification will be based on the highest 12-month running annual average of 24 monthly samples. Alternatively, bin classification may be based on the 2-year mean if the system conducts twice per month monitoring for 24 months (*i.e.*, 48 samples).

Systems that fall in Bin 2, 3, or 4 can choose from a "toolbox" of options to achieve the required level of *Cryptosporidium* removal/inactivation, summarized in Table 8.13. Systems have three years following initial bin classification to meet the treatment requirements associated with the bin. IDEM may grant systems an additional 2-year extension to comply when capital improvements are necessary. Systems currently using ozone, chlorine dioxide, UV disinfection, or membranes in addition to conventional treatment may receive credit for those technologies toward bin requirements.

Table 8.13
LT2-ESWTR Toolbox Options

| Approach | Potential Log Credit | | | |
|---|---|---|---|---|
| | 0.5 | 1 | 2 | >2.5 |
| Watershed Control | | | | |
| Watershed Control Program (1) | X | | | |
| Reduction in oocyst concentration (3) | | As measured | | |
| Reduction in viable oocyst concentration (3) | | As measured | | |
| Alternative Source | | | | |
| Intake Relocation (3) | | As measured | | |
| Change to Alternative Source of Supply (3) | | As measured | | |
| Management of Intake to Reduce Capture of Oocysts in Source Water (3) | | As measured | | |
| Managing Timing of Withdrawal (3) | | As measured | | |
| Managing Level of Withdrawal in Water Column (3) | | As measured | | |
| Pretreatment | | | | |
| Off-Stream Raw Water Storage (21-60 days) (1) | X | | | |
| Off-Stream Raw Water Storage (>60 days) (1) | | X | | |
| Pre-Sedimentation Basin w/ Coagulation | X | | | |
| Lime Softening (2-Stage) | X | | | |
| Bank Filtration (25 ft. setback) | X | | | |
| Bank Filtration (50 ft. setback) | | X | | |
| Improved Treatment | | | | |
| Lower Finished Water Turbidity (0.15 NTU 95$^{th}$ percentile combined filter effluent (CFE)) | X | | | |

Table 8.13
LT2-ESWTR Toolbox Options

| Approach | Potential Log Credit | | | |
|---|---|---|---|---|
| | 0.5 | 1 | 2 | >2.5 |
| Lower Finished Water Turbidity (0.15 NTU 95th percentile individual filter effluent). Credit is not in addition to the 0.5-log available for lower CFE turbidity. | | X | | |
| Slow Sand Filters as add-on (no prior chlorination) | | | | X |
| Second Stage Filtration | X | | | |
| Membranes (MF, UF, NF, RO) (1) | | | | X |
| Bag Filters (1) | | X | | |
| Cartridge Filters (1) | | | X | |
| Improved Disinfection | | | | |
| Chlorine Dioxide (2) | | Based on CT | | |
| Ozone (2) | | Based on CT | | |
| UV (2) | | Based on CT | | |
| Peer Review/Other Demonstration/Validation or System Performance | | | | |
| Peer Review (performance equivalent to Partnership Phase IV) | | X | | |
| Demonstration of Performance (spore removal >4-log) | | X | | |

(X) indicates potential log credit based on proper design and implementation in accordance with EPA guidance.
(1) Criteria to be specified in guidance to determine allowed credit.
(2) Inactivation dependent on dose and source water characteristics.
(3) Additional monitoring for Cryptosporidium after this action would determine new bin classification and whether additional treatment is required.

## 8.2.6 Stage 2 Disinfectants/Disinfection By-Products Rule

### *Purpose*

The Stage 2 Disinfectants/Disinfection By-Products Rule (Stage 2 DBPR) builds upon the Stage 1 DBPR to further reduce public exposure to disinfection byproducts (DBPs). Because DBP concentrations can increase with increasing time (i.e., increasing water age), the USEPA is emphasizing compliance monitoring locations that reflect parts of the distribution system with older water. Compliance monitoring for the Stage 2 DBPR will be preceded by an initial distribution system evaluation (IDSE) to select site-specific optimal sample points for capturing peaks. The Stage 2 DBPR is designed to reduce DBPs at single locations in the distribution system by changing compliance monitoring requirements.

### *Applicability*

The requirements in the Stage 2 DBPR will apply to all community water systems and nontransient noncommunity water systems that add a disinfectant other than UV or deliver water that has been disinfected.

*Schedule*

The proposed rule is anticipated in 2003, with a final rule published in 2004. Compliance dates may be simultaneous with those for the Long Term 2 Enhanced Surface Water Treatment Rule (LT2-ESWTR) – anticipated between 2008 and 2010.

*Requirements*

The Stage 2 DBPR requires compliance with the DBP MCLs established in the Stage 1 DBPR; however, it changes how compliance levels are calculated. Stage 2 DBPR MCL compliance requirements follow:

- TTHMs: 80 µg/L based on a Locational Running Annual Average (LRAA)
- HAA5: 60 µg/L based on a LRAA
- Bromate: 10 µg/L. Additional research on bromate detection, formation, treatment, and health effects is underway.

The Locational Running Annual Average (LRAA) approach means each compliance monitoring sampling location has to comply with the MCL on a running annual average basis, as opposed to the current practice of averaging the results from all locations in the distribution system.

Systems must comply with the Stage 2 DBPR MCLs for TTHMs and HAA5 in two phases:

- *Phase 1:* All systems must comply with a 120 µg/L TTHM LRAA and a 100 µg/L HAA5 LRAA (120/100) based on Stage 1 DBPR monitoring sites and also continue to comply with the Stage 1 80/60 RAA. This will begin three years after rule promulgation (with an additional two-year extension available for systems requiring capital improvements).
- *Phase 2:* Systems must comply with an 80/60 LRAA based on new sampling sites identified under the IDSE. This will begin 6 years after rule promulgation (with an additional 2 year extension available for systems requiring capital improvements) for large and medium systems.

Once the Stage 2 DBPR has been promulgated, systems will conduct an initial distribution system evaluation (*i.e.,* IDSE) to identify locations in the distribution system with high DBP levels. Small systems must submit a report recommending new DBP compliance monitoring locations and supporting data with the results of their IDSE (including any monitoring) four years after final rule publication. Based on the IDSE results, Stage 1 DBPR compliance monitoring sampling locations will be revised to better capture locations with high DBP levels. The revised compliance monitoring sampling location plan will be submitted to the primacy agency for review and approval.

If a system purchases water, the IDSE may be required earlier than other small systems. The IDSE submittal date is based upon the size of the largest system in the combined distribution system. If the system from which water is purchased serves more than 10,000 persons, the IDSE is due at the same time as large systems.

Stage 2 DBPR compliance monitoring frequency for systems serving fewer than 10,000 people should remain the same as required by the Stage 1 DBPR. Stage 1 DBPR requires collection of eight samples as follows:

- Systems using chloramines will take two samples at or near the entry point to the distribution system, 2 at locations with average residence times, and 4 at locations with anticipated high TTHM/HAA5 levels.
- Free chlorine systems will take 1 sample at or near the entry point to the distribution system, 2 at locations with average residence time, and 5 at locations with anticipated high TTHM/HAA5 levels.

Following completion of the IDSE, the Stage 2 DBPR requires collection of four additional samples at new locations as follows:

- One at a representative average point (a current Stage 1 DBPR location);
- One representative point with high HAA5 levels identified by the IDSE; and
- Two representative points with high TTHM levels identified by the IDSE.

Guidance will be developed to assist systems in developing their IDSEs, evaluating the IDSE results, and revising their compliance monitoring sampling locations.

## 8.3 Radon Rule

*Purpose*

Radon is a colorless, odorless, tasteless, chemically inert, and radioactive gas. It forms naturally from the radioactive decay of uranium and is most commonly found in soils and ground waters. The primary risk of exposure is lung cancer from radon entering indoor air from soil under homes. Tap water is a smaller source of radon in air; however, breathing radon released to air from household water uses also increases the risk of lung cancer, and consumption of drinking water containing radon presents a smaller risk of internal organ cancers, primarily stomach cancer. The Radon Rule is being developed to reduce public radon exposure.

*Applicability*

The proposed Radon Rule applies to all community water systems (CWSs) that use ground water or mixed ground and surface water. The regulation will not apply to nontransient noncommunity (NTNC) public water supplies or to transient public water supplies.

*Schedule*

The Radon Rule was proposed in November 1999 and is expected to become final in late 2003.

*Requirements*

To comply with the rule, community water systems would need to meet a MCL of 300 pCi/L or meet an alternative MCL (AMCL) of 4,000 pCi/L and participate in a state-run (or their own) multimedia mitigation (MMM) program. MMM programs should:

- Include public involvement during their development,
- Set quantitative goals for mitigating the overall radon risk in existing and new homes,
- Identify strategies for meeting those goals, and
- Track and report progress.

Small systems are expected to comply with the Radon Rule by meeting the AMCL and participating in an approved State MMM program (or implementing a CWS MMM program in the absence of a State MMM program). To assist small systems in compliance decisions, the USEPA has developed a conceptual model for compliance with the MCL, AMCL and MMM programs as illustrated in Figure 8.3. Small systems may elect to comply with the MCL instead of implementing an MMM program, in which case high-performance air stripping, granular activated carbon (GAC), and point-of-entry GAC units are feasible radon removal treatment technologies.

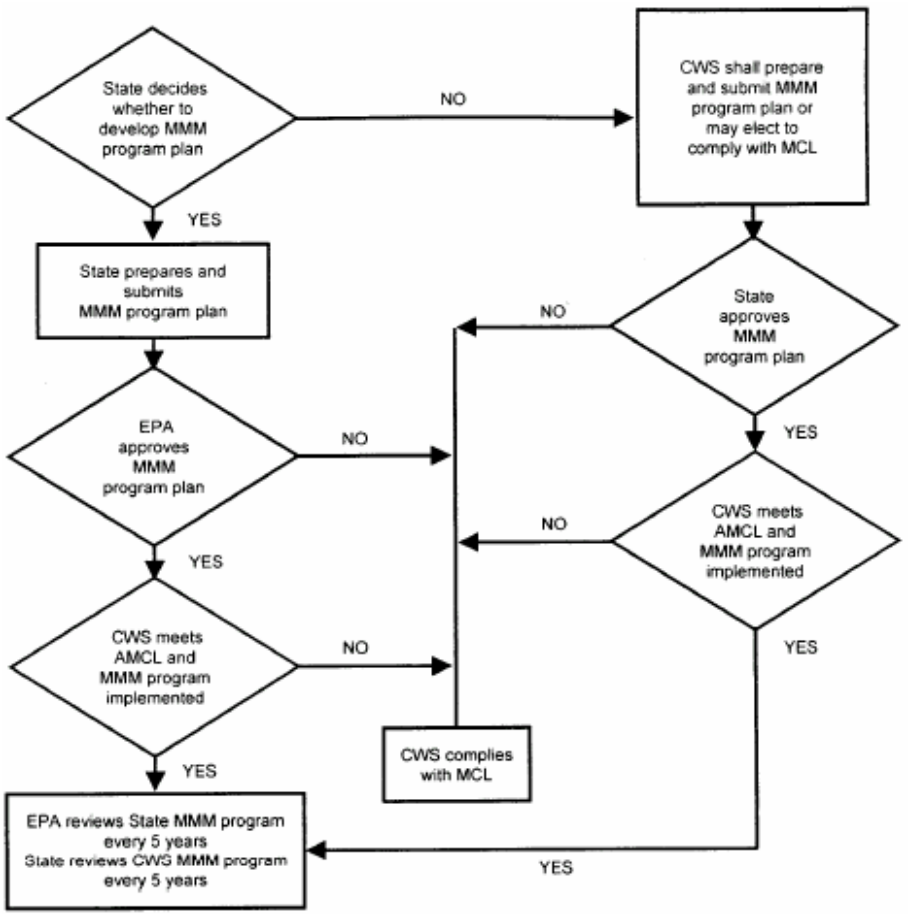


Figure 8.3
Conceptual Model for the MCL, AMCL and MMM Program
(Small Systems)

## 8.4 Operational Rules

*Purpose*

The purpose of this rule is to establish and maintain standards of operation and require corrections to drinking water sources water treatment plant and distribution system operations so as to protect human health and prevent adverse impacts to drinking water.

The rule is intended to provide clear guidance to owners and operators regarding the minimum operating standards for Indiana public water systems.

Owners of public water systems will be responsible for ensuring that the system complies with the rule and the system's operating staff has all of the resources and training necessary for proper maintenance of the system.

*Applicability*

The standards and practices established in the rule will apply to the operation and maintenance of all new or existing public water systems in Indiana. Each public water system shall comply with the rule.

*Schedule*

The Operational Rule was proposed in June, 2001 and is expected to become final in 2004.

*Requirements*

To comply with the rule, water systems will need to establish or modify their operations and maintenance programs to meet the requirements of the rule; maintain a system pressure at or above a minimum level; when using disinfection methods, maintain residuals at or above a minimum level; inspect water storage tanks at least every 5 years and correct significant system deficiencies in a timely manner, including exceedances of secondary MCLs for iron and manganese.